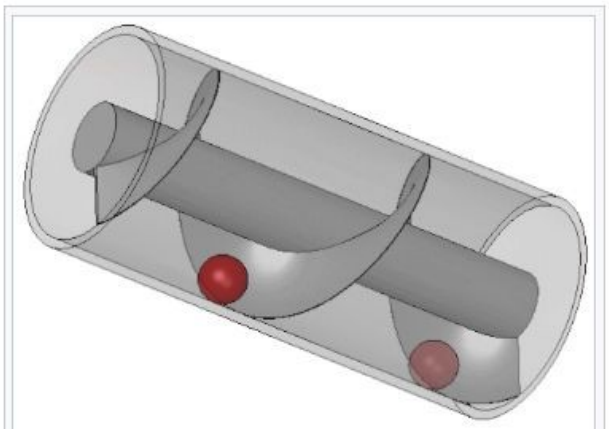
Research on Making an Archimedes type Screw Lift for a Future Marble Game

How to Make the Screw

I am envisioning this type of set-up, like a grain auger…….



Turns out you don't need a cylinder around the screw, can be ½ moon on the bottom, or even a board on side.

Perplexity

I asked perplexity about it, one option is to make some curved pieces that you glue onto a square rod, like 1 guy did.

Boy, that is a lot of work, and a lot of sanding to make a screw that will lift 16 inches, and since at an angle, will be more like 18 or 19 inches long!!

Worm Gear Option

It will just take a lot of time to remove all the material, since threads will be about 1.25" pitch, which means removed 1.25" of material. If it took 2 hours to make a 4" long worm gear, then it will take 20/4 x 2 hours = 10 hours of Dremel work. If it took 1 hour to make a 4" worm gear, then 5 hours of Dremel work!!

Router Fixture Option

You need a way to link turning the dowel being machined to the travel rate of the router on a carriage so you end up with about 1.25 pitch. So if 2 threads take 2x1.25 = 2/(2x1.25) = 0.80 TPI

I could use a piece of ½ x 13 TPI all thread rod from Ace or McMaster-Carr.

Gear ratio = 13/0.80 = 16.25 gear ratio

On spur gears, about 2:1 is max ratio for using 2 gears, would take multiple spur gears to get the 16.25 ratio.

A 1 inch rod has 8 TPI……

8/.80 = 10 gear ratio instead of 16.25 on a ½ inch piece of all thread, still too much for spur gears

Worm Gear approach with router

So on a worm gear, gear ratio is number of teeth on the spur gear. I can't have 16.25 teeth.

If a = pitch of screw
b= 1/a TPI of screw
c= TPI of all thread

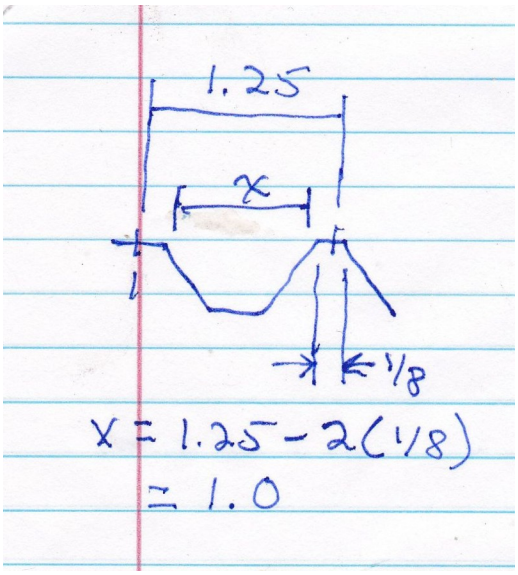
Gear ratio = TPI of all thread/TPI of screw

16 = 13/(1/a)

1/a =13/16

a = 1/(13/16)

a =1.23 which is pitch of screw I am making, little smaller than 1.25 inch target



I am using 1 inch diameter marbles, so I don't think 1.25 pitch is enough. Kind of also depends on what router bits are available?

Dowels from Menards

2" diameter birch is biggest OD I have, or they sell.

Core Box Router Bits from MLCS

Take a look at other MLCS brand items.

★★★★★

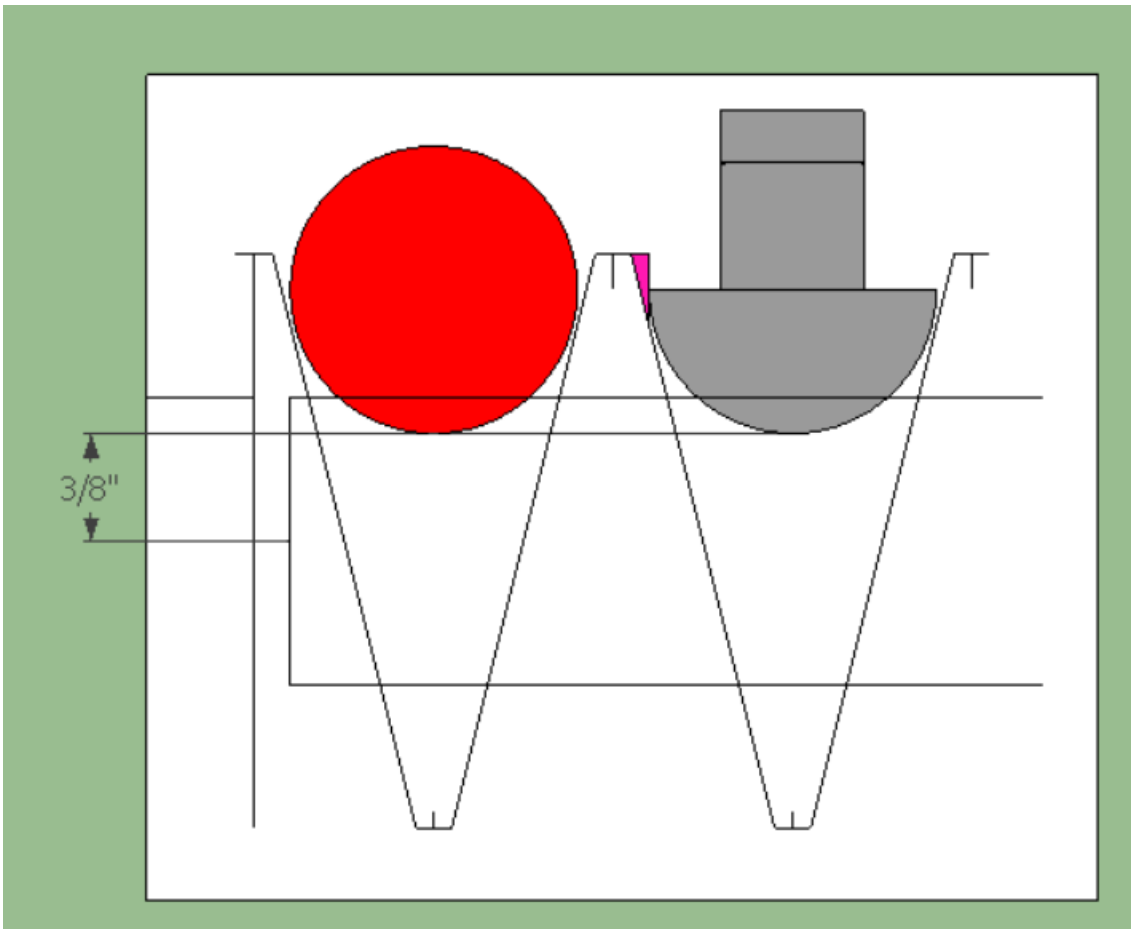
✔ Ships Same Day

MLCS 1" Core Box Router Bits creates a semi-circular groove or channel in a workpiece.

Category: MLCS Core Box

Lay out in Sketchup

use 2” diameter birch dowel
1.25 pitch on screw
use 1” diameter router bit, called a Core Box Router bit
Leave 1/8” width on top of screw threads, like I do when making worm gears



Comments on Sketchup Layout

So the 1 inch diameter core box router bit will leave the pink colored piece shown in the cross section above, which means no clearance for a 1 inch diameter marble.

I don’t know how much I need to engage the 1 inch diameter marble, but I think I want slightly more than ½ the diameter as shown above.

I think this is not enough clearance, some marbles are slightly over the 1.0 inch diameter as I have measured before.
MLCS makes a 1-1/8” diameter core box bit, let’s lay that out in Sketchup.

Take a look at other MLCS brand items.

★★★★★

MLCS 1-1/8" Core Box Router Bits creates a semi-circular groove or channel in a workpiece.

Category: MLCS Core Box

Is 1/8” enough width for top of screw?

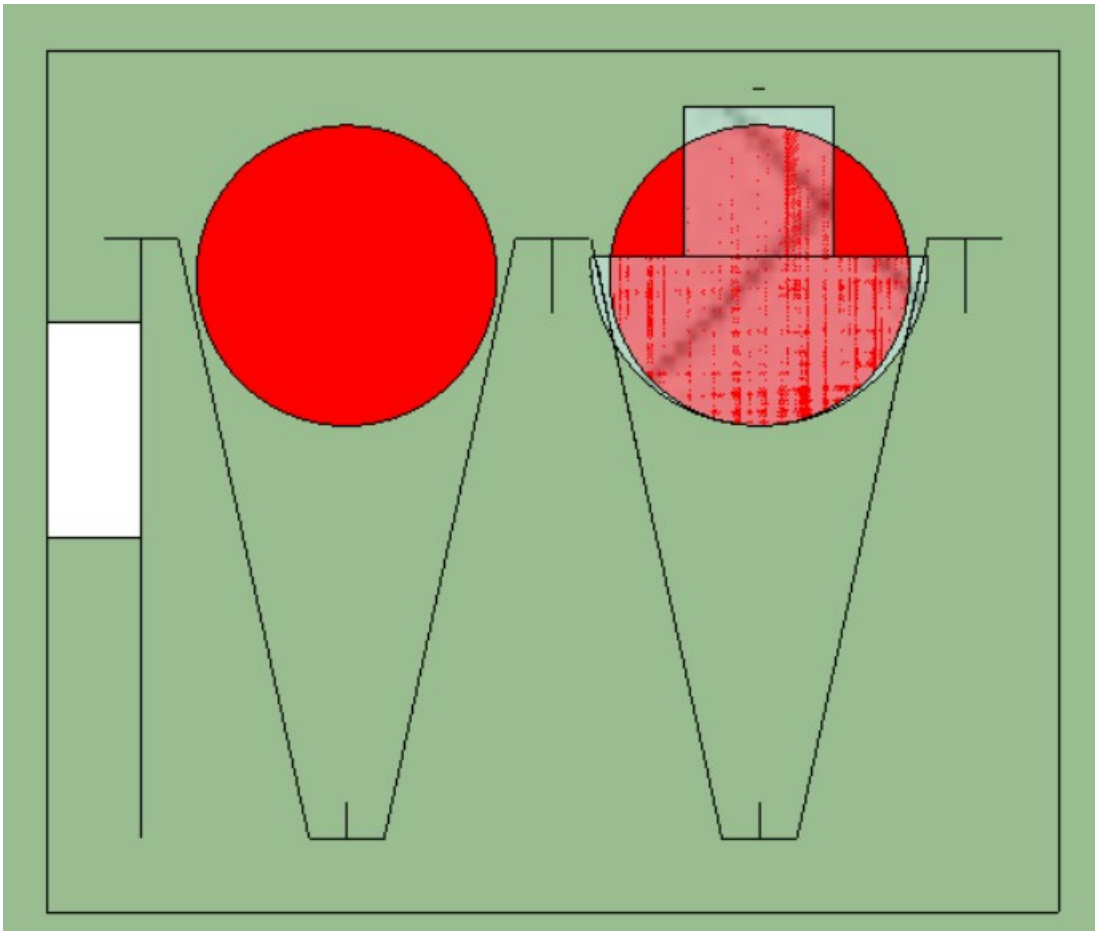
I have done this making worm gears OK, but I am using a Dremel with a small deburr type steel bit and it does not chip out any of this 1/8” wide top of the teeth.

But using a router bit, my experience says it might chip a lot, I am not sure.

What would happen if I leave ¼” versus 1/8” for the teeth width?

New Sketchup Layout

1.375 pitch on screw (increased from 1.25)
1.125 diameter core box router bit
.25 versus.. .125 height of teeth to prevent tearing out when routing



Comments on Sketchup Layout

Boy, this sure looks a lot better, more clearance for the 1 inch diameter marbles and wider tops of the teeth to prevent tear-out from routing.

Now, I need to modify the gear ratio based upon a 1.375 versus 1.25 pitch on the screw.

Target Pitch on Screw Being Made ==>				**1.375**
All Thread Diameter	All Thread TPI	Gear Ratio which is # of teeth on spur gear of worm gear set driving it	TPI of screw being made	Pitch on Screw Being Made
0.5	13	18	0.722222	1.38
0.5	13	17	0.764706	1.31

Using a Worm Gear that has a mating spur gear with 18 teeth, which is the gear reduction ratio of the worm gear set, gives a target pitch of 1.38, a little bigger than the 1.375 I want, which should be fine.

Solution

Will have a worm gear set made from wood with a gear ratio of 18:1. This achieves the desired gear ratio of 18:1 between the ½" all thread causing the router carriage to move and the rotation of the 2" dowel being cut with a spiral screw shape.

Worm gear will be coupled to the ½" all thread causing the router carriage to move.

The spur gear part of the worm gear set will be coupled to the 2" diameter dowel that is having the screw profile cut into it. The hand crank will be coupled to this spur gear to drive it.

Cranking time

Perplexity AI program estimates about 15 minutes of cranking time per 1 pass on the 16 inch long screw being made. Experience says 1/8" deep per router cut is about right, so it will take 4 passes at 15 minutes each to make the wood screw, or 60 minutes.

I could reduce this time by using a 1 inch diameter by 8 TPI all threaded rod, but it changes the worm gear set ratio.

Target Pitch on Screw Being Made ==>				**1.375**
All Thread Diameter	All Thread TPI	Gear Ratio which is # of teeth on spur gear of worm gear set driving it	TPI of screw being made	Pitch on Screw Being Made
0.5	13	18	0.722222	1.38
0.5	13	17	0.764706	1.31
1	8	11	0.727273	1.38

So if I use a 1 inch by 8 TPI piece of all threaded rod and nut, I can reduce my cranking time, but my worm gear set needs a spur gear with 11 teeth which is gear ratio for the worm gear set.

Perplexity estimates 9 minutes per pass using the 1" all thread, or a total of 36 minutes for 4 passes. A big reduction in cranking time!

It will cost a few more dollars for the 1" versus 2" threaded rod, but worth it to reduce my cranking time.

Cost All thread Rod

McMaster-Carrr

Low strength

24 inches long

$21 for 1 by 8 TPI and $5 for ½ by 13 TPI

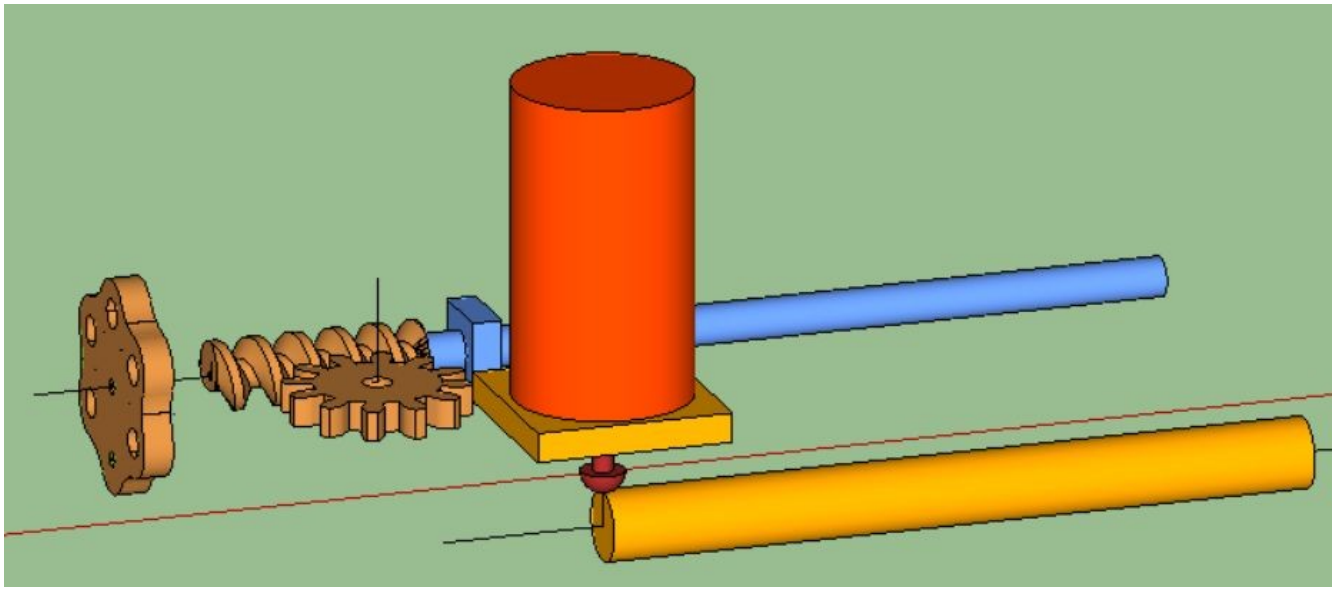
cost difference of $16, not a big deal.

One square nut will be a few $ more.

November 29, 2025

OOPS

I started to lay out the concept for the router fixture to make the Archimedes screw.



Somehow I have to connect the spur gear on the worm gear set, which has a vertical shaft, to the horizontal piece of 2” diameter dowel being machined.

I would have make a bevel gear set or Grist Mill gears (peg gears) with a 1:1 ratio to transmit the power 90 degrees.

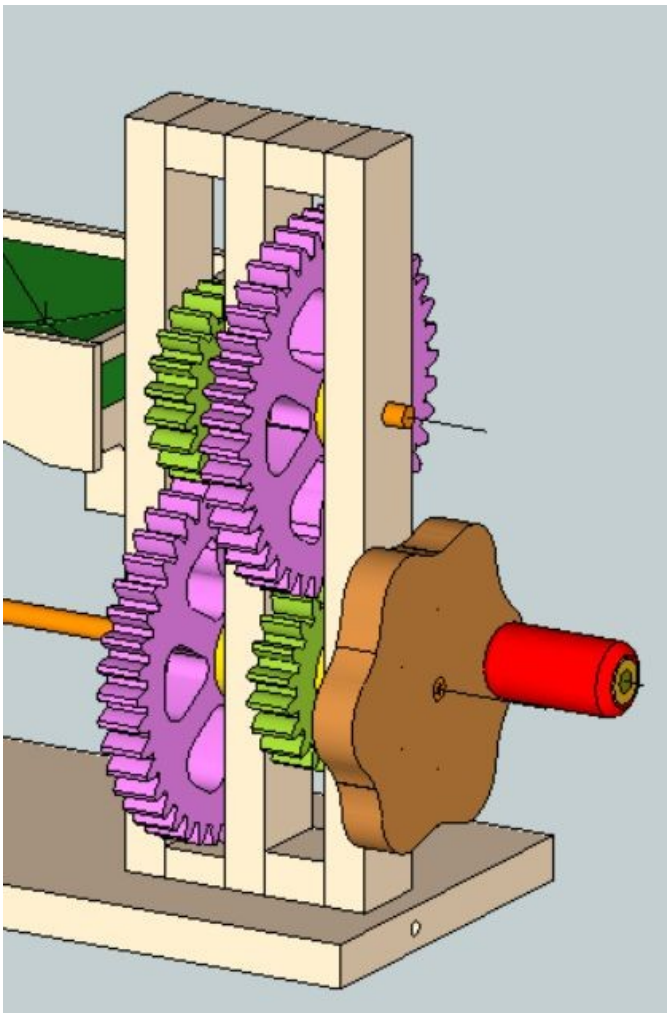
I have made two sets of 90 degree bevel set gears, but they are not really suitable for this application, they have a lot of backlash and will take hardly any load.

I have made 2:1 gear ratio peg gear sets before, but not with a 1:1 ratio.

Maybe using a set of 4 spur gears would be a better option than the worm gear set??

4 Spur Gear Set

I made a 4 spur gear set with a 4:1 gear ratio for the golfing automaton I made a couple of years ago…



The shafts of the two lower gears are not connected to each other, and this gives a 4:1 ratio.

The gear train in pitch diameters was 3, 6, 3, 6.

I need about an 11:1 ratio using 1” threaded rod with 8 TPI.

Input 1	Driven 2	Driven 3	Driven 4	Ratio
3	6	3	6	4
3	10	3	10	11.11111
3	10	3	10	11.11111

If I use a 3, 10, 3, 10 pitch diameter gear train, I get a ratio of 11.1111.

what I switch to 4 spur gears?				
Target Pitch on Screw Being Made ==>				**1.375**
All Thread Diameter	All Thread TPI	Set of 4 spur gears	TPI of screw being made	Pitch on Screw Being Made
1	8	11.1111	0.720001	1.39

So using the 4 spur gear set with an 11.1111 gear ratio gives me a pitch of 1.39 on the 2" diameter dowel being machined into an Archimedes screw to lift 1 inch diameter marbles. This should work fine.

Now I need to lay out in Sketchup and see if I can package it OK.

Spur Gear Design

Diametral pitch of mating gears must be equal!			
PD	#Teeth	Diametral	Ok
3	10	3.3333	no
10	33	3.3000	
3	12	4.0000	yes
10	40	4.0000	
3	15	5.0000	yes
10	50	5.0000	
3	9	3.0000	yes
10	30	3.0000	

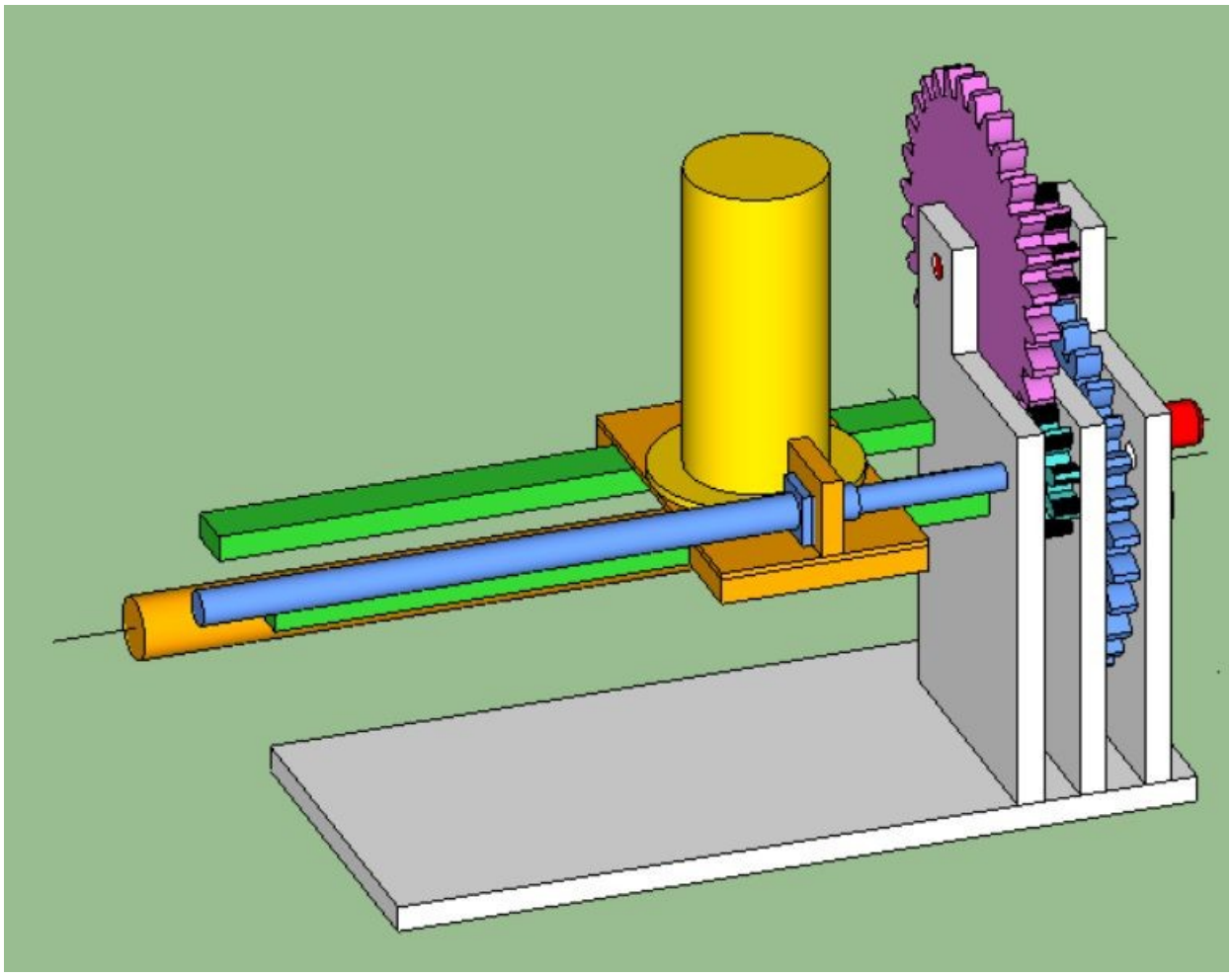
PD	#Teeth	Diametral Pitch
3	9	3.0
10	30	3.0

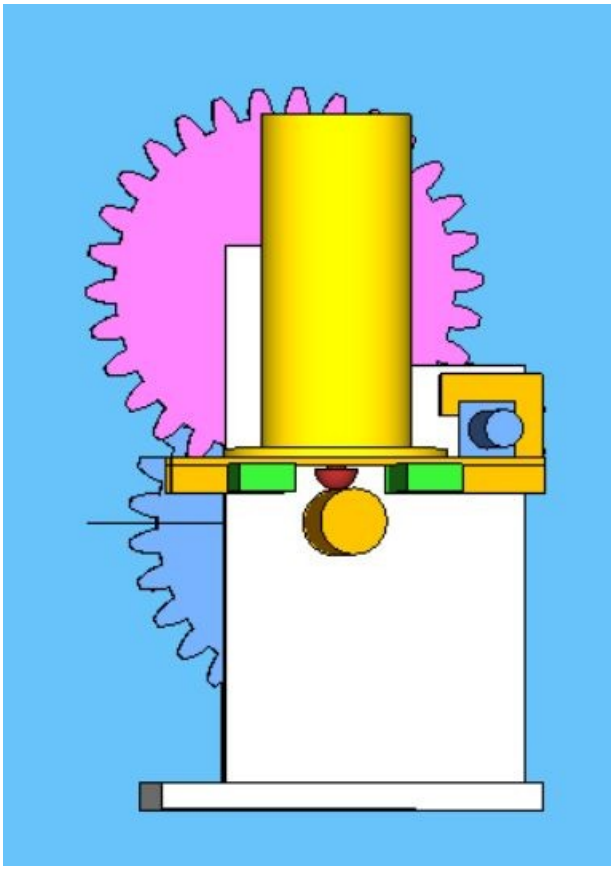
Status of Fixture Design on Morning of November 30, 2025

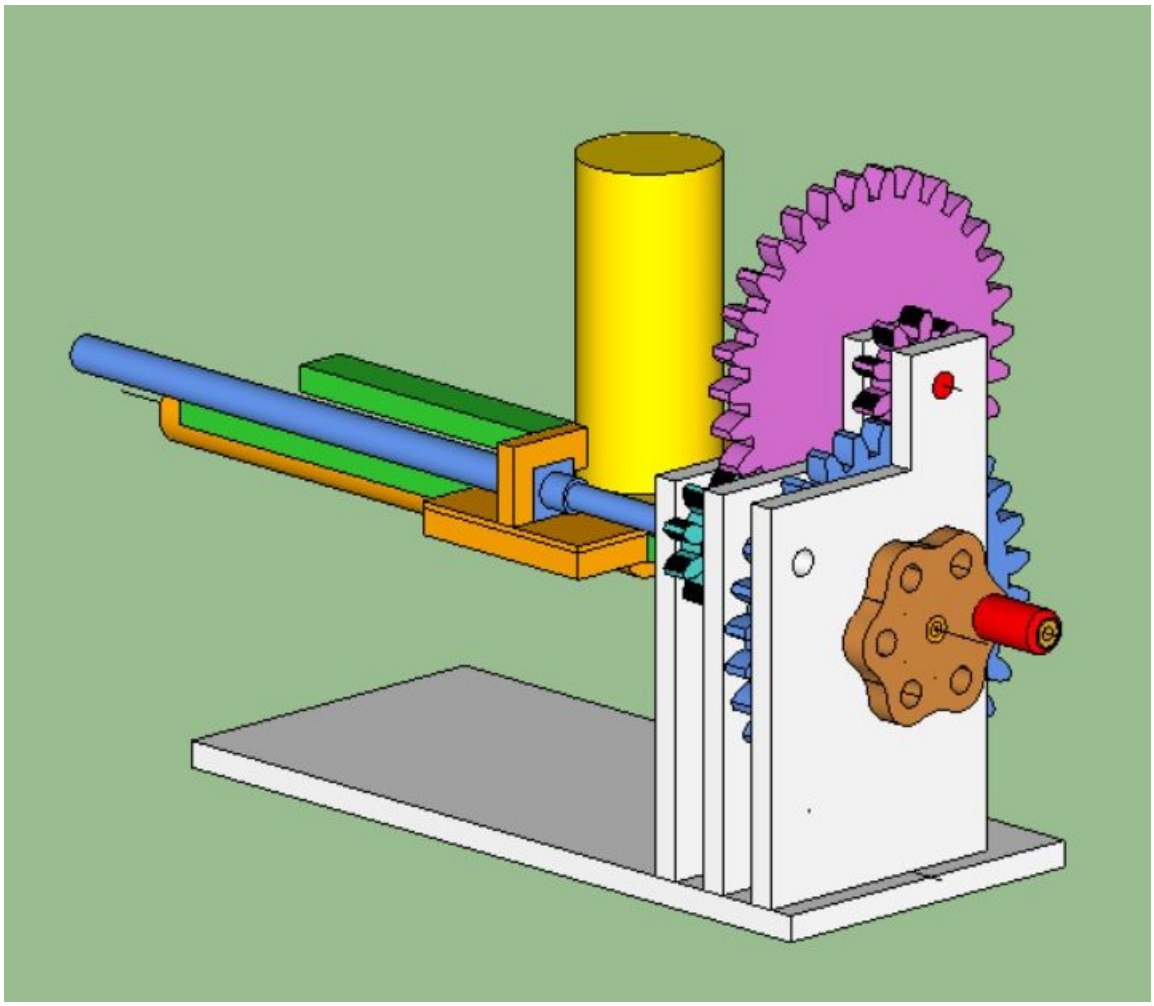
Got concept design pretty well completed. Items to complete include:

1. Connection method between 2” diameter dowel being machined and the crank. Both ends of dowel. Have to be able to install and remove the piece being machined.

2. Connection between 1” x 8 TPI rod and ¾” wood dowel which makes the bearing. Need bearing on both ends.







Final Location of 3 Key Shafts

The location of the center-line of the 2” dowel being machined is pretty well known.

The location of the center-line of the threaded rod kind of depends on the final build of the router base and its sliding fixture.

The 3rd shaft for the top 2 gears is really a function of the location of the other 2 shafts.

The 3 vertical boards on the RH side of the fixture are about 8” wide, so I can cut them from a standard pine 1×12. It is not a big deal to remake them if 1 of the key shaft locations has to change during the actual build.

Coupling

On 1” threaded rod to ¾” dowel, will use a 2” diameter wood coupling with a ¾” hole halfway through and then a 1” hole on the other half. Will use 1/8” brass pins held in place with hot melt glue to connect the shafts to the couplings. Can increase the 1/8” size if not sturdy enough.

On 2” dowel being machined, will drill ¾” hole maybe 1.5 inches deep in each end, glue in a ¾” oak dowel, then connect with the crankshaft dowel with a 1.5” OD coupling drilled ¾” thru with 2 brass pins and hot melt glue.

I have done similar couplings on other models, and hot melt lets you dis-assemble if you need to.

Lateral Brace

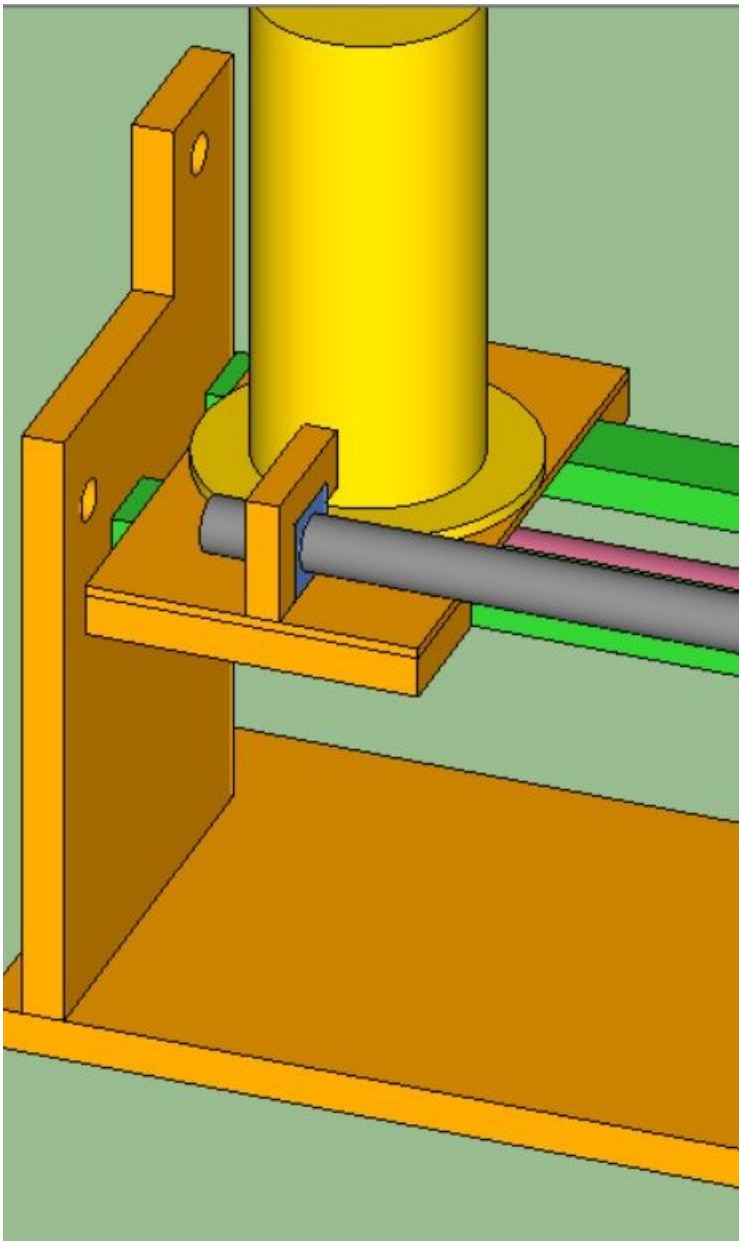
Added 5×5 x ¾ wood brace to keep the group of 3 vertical boards on RH side of fixture at 90 degrees to the base.

Potential Problem

The 2” dowel being machined is 2” diameter and 18 inched long.

Yesterday I ordered the 1×13 TPI threaded rod to be 24 inches long, thinking I needed more than 18” and 6 more inches should be enough.

But when I moved the router carriage to the farthest LH position, I don’t have length on the threaded rod!



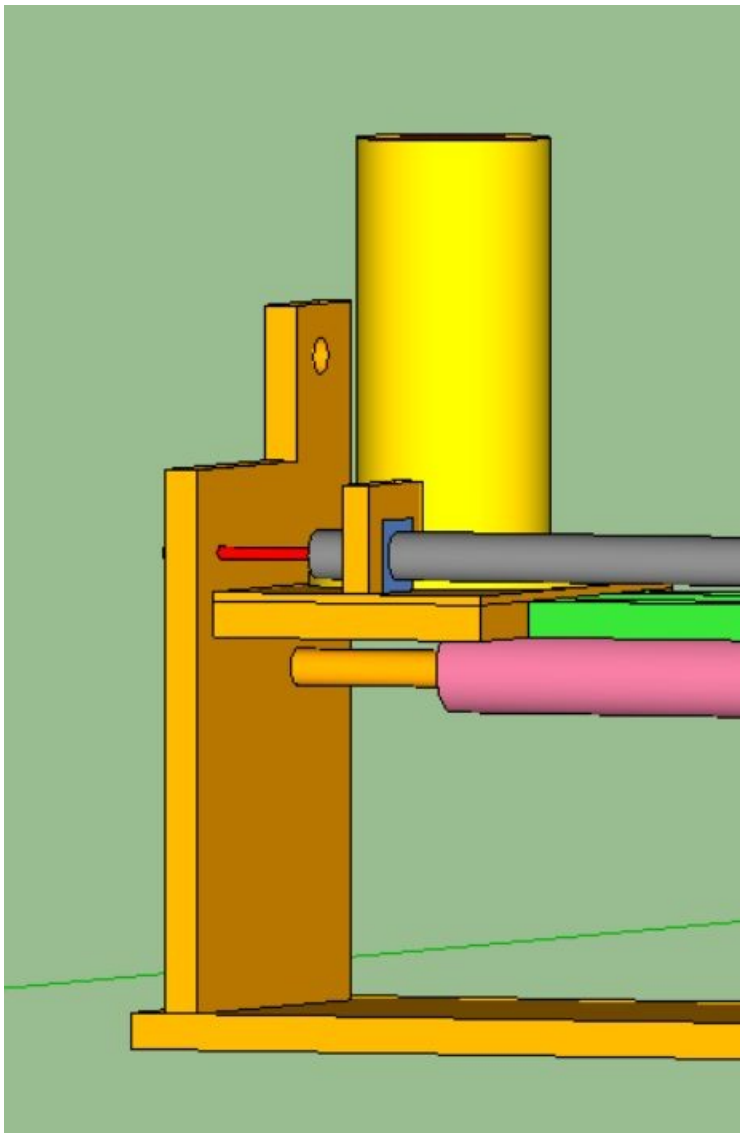
So right now, I am thinking to load the 2” blank dowel into this fixture, I will remove the LH vertical board. Then I will install the dowel and the other stuff, then I slide the LH vertical board to the right, into position, then screw it to the base board and the 2 green horizontal carriage guides.

One option would be to drill and tap a ¼” hole in the LH end of the 1x8 threaded rod, then install a ¼” steel bolt with the head cut off, and that will slide into a ¼” hole in the LH vertical piece.

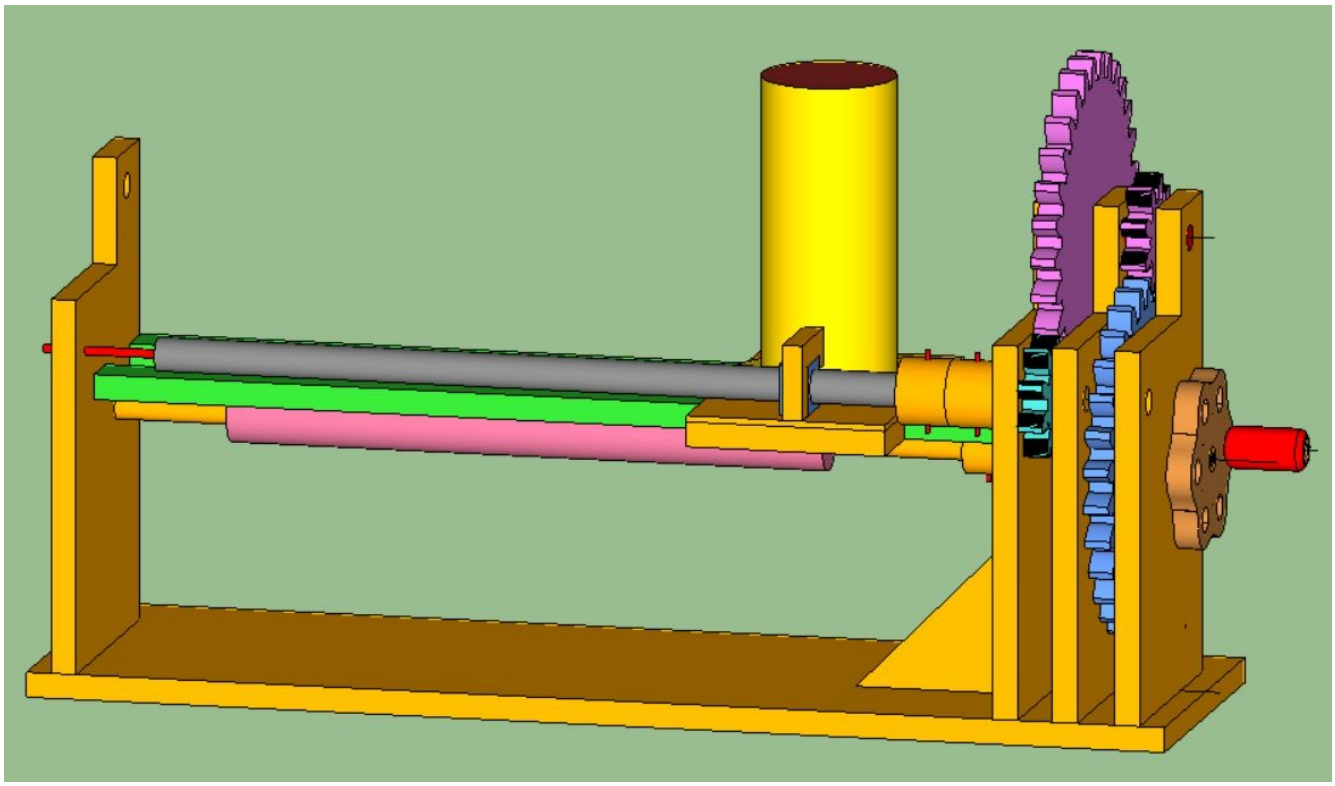
The other option would be to raise the square nut and 1” threaded rod up maybe a ½” to give enough clearance for another wood coupling between the 1” steel rod and say a ¾” oak dowel, but then I have to change the gear locations on the RH side.

For now, I will assume I can make the ¼” steel rod extension idea work.

Router Carriage in Left Hand Position



Router Carriage in RH Position



Router Carriage Fast Return

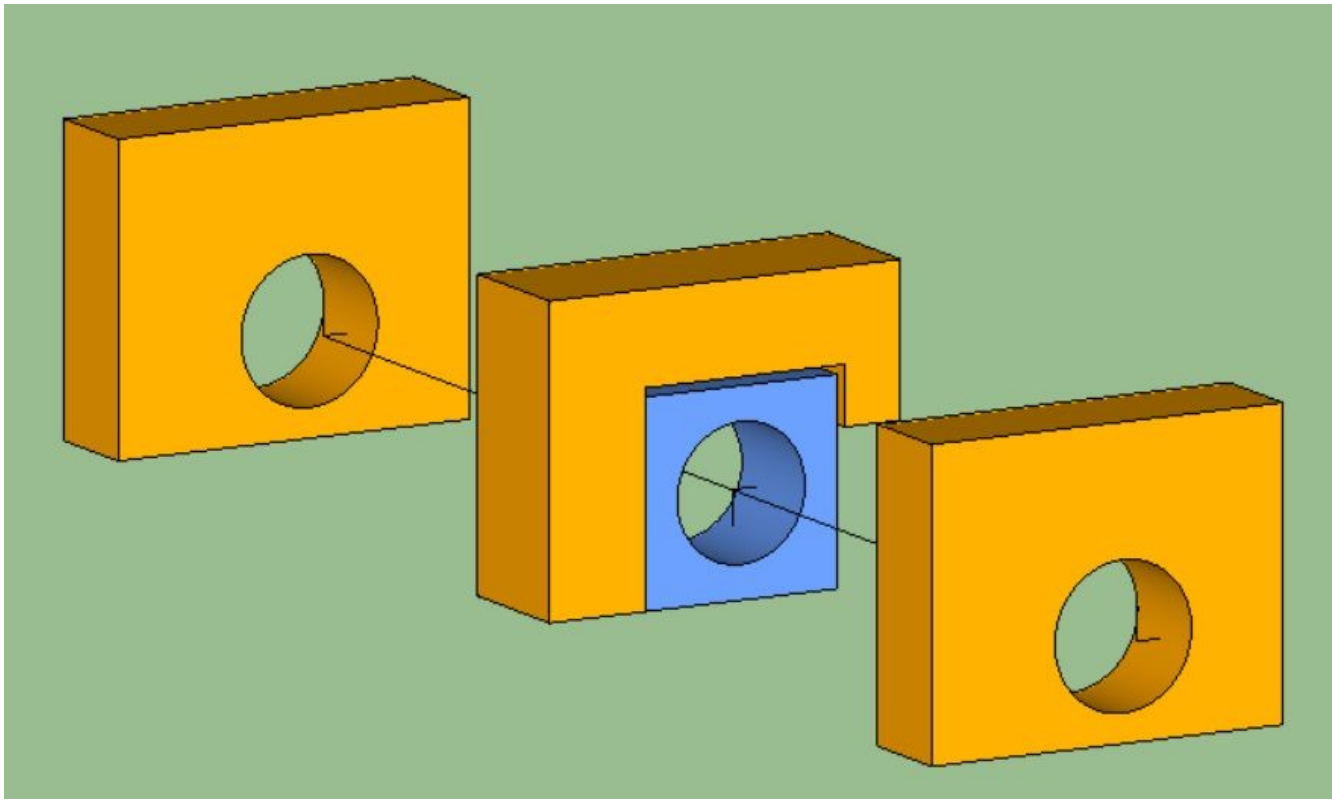
-set up fixture with carriage in RH position
-start up router and leave on
-manually crank and start to advance the carriage to the left cutting 1/8” deep per pass

-once carriage reaches LH end, I could stop router, lower router bit 1/8”, then crank in opposite position to move the carriage left to right

-but the system might have too much backlash, making sloppy spiral grooves in the 2” diameter dowel being machined

-as an option, could attach electric drill to the ¼” steel rod screwed into the 1x13 rod on the LH side, and quickly advance the router carriage to the RH position, with the router off. Then lower router bit 1/8, and start cranking for the next cut.

Exploded view of 3 pieces of wood to hold the 1” square nut



Router carrier is built

Had to bandsaw a little clearance for the router base on the bottom of the squarer nut retainer block as shown above.

OOPS Shop Equipment Problem

Sears Bandsaw or Band-saw, I cut out the 2 small gears from red oak.

Then started to cut the bit 10” gear using MDF with oak veneer, bandsaw starting making noise, then blade would stop as I tried to feed the wood into the blade??

Found Allen Screw had come loose on top pulley, and square key had fallen to the ground. You can remove the pulley from the belt, with the top guard on the belt, push on the pulley, tap in the square key until it is flush, then tighten Allen screw, then stretch belt over the pulley and reinstall the top guard.

Once in a while the key falls out of the old 1968 sears 10 inch table saw also, but it is harder to fix than the bandsaw.

Oak veneer plywood instead of gluing up red oak

I have 2 pieces of MDF covered with oak veneer, that I will likely never use. Going to try to use these to make the 2 big 10 inch gears. Veneer gives teeth some strength and they should not be under a lot of load when making Archimedes screws.

Ready to drill and tap 3/4x8 TPI threaded rod on 1 end for ¼-20 bolt

Perplexity says to use a #7 drill bit, but Ace does not carry it. Closest fractional size is 13/64, so I bought 2 of those at Ace in case I break one. Bought 1/4x20 bolt, 4.5 inches long, will cut off head and then screw into end of ¾ threaded rod.

Drill Bit Size Category	Drill Bit Size	Decimal Inc Size	Metric mm Size	Tap Or Screw Size	Tap Or Screw Size Category	Thread Standard
Inch	**1/8**	0.1250	3.18	**5/32-32**	Inch	UNS
Number	**30**	0.1285	3.26	**5/32-36**	Inch	UNS
Number	**26**	0.1470	3.73	**3/16-24**	Inch	UNS
Number	**22**	0.1570	3.99	**3/16-32**	Inch	UNS
Number	**12**	0.1890	4.80	**7/32-32**	Inch	UNS
Number	7	0.2010	5.11	**1/4-20**	Inch	UNC

48-89-2210
Milwaukee
TITANIUM
DRILL BIT
Broca de titanio
Foret en titane
UP TO
3x
LIFE
NO WALKING
135°
THICKER CORE
RESISTS
BREAKING
THUNDERBOLT®
13/64
5,2
mm
Vida hasta
3 veces
más larga
Jusqu'à 3x
plus durable
Sin
desplazamiento
Sans patinage
Con núcleo más grueso
que resiste
la ruptura
Un corps plus épais
résiste à la rupture
3 FLAT SECURE-GRIP™
METAL

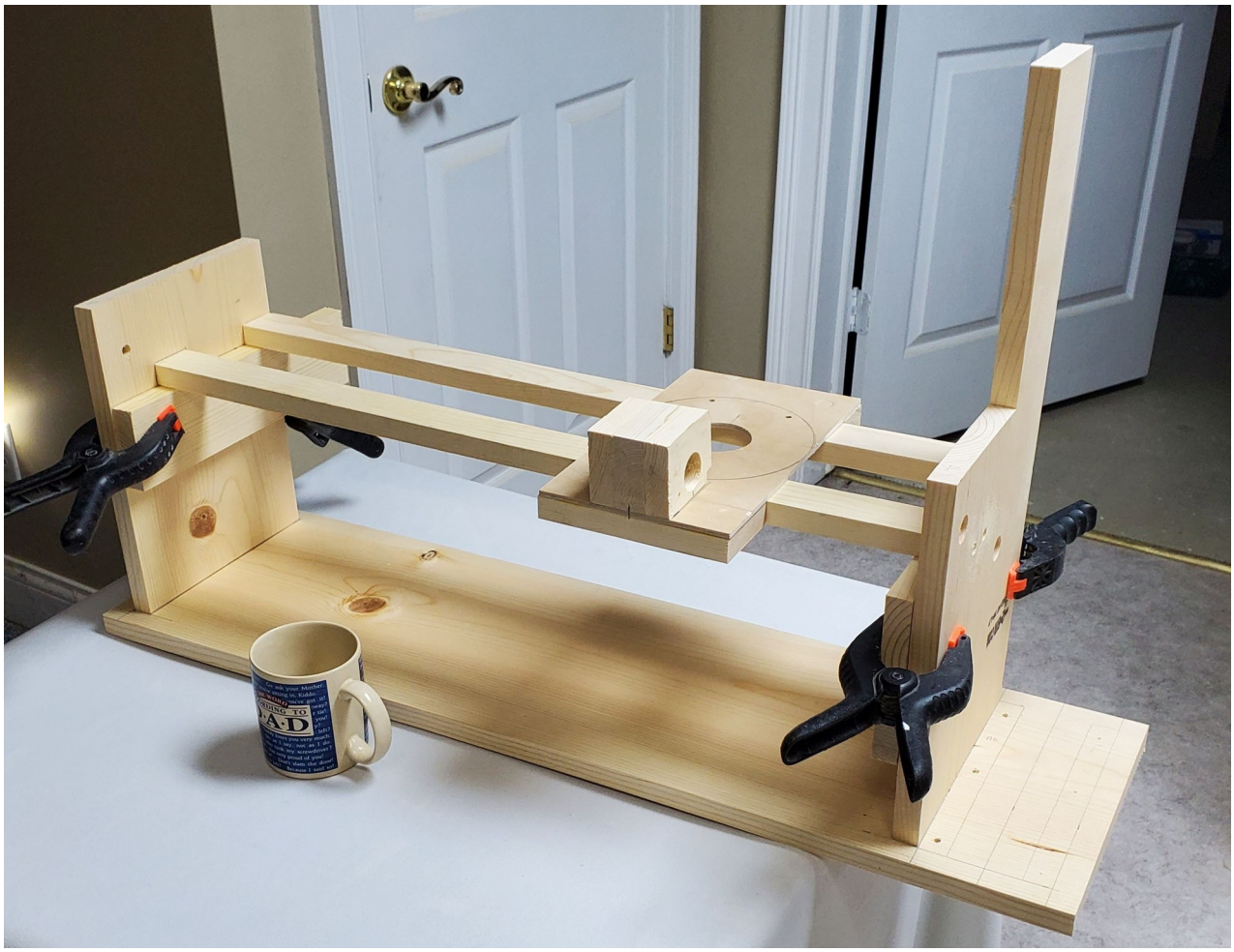
18 Piece of all thread just fit into my drill press

Center punched the center as best as I could eyeball it, will never get it exactly on center, hopefully my fixture will accept some run-out between ¼ and ¾” rod.

Drilled with 1/8” bit first, then drilled 13/64, was easy to drill, rod is fairly soft since I chose low strength for this application, used a little 3 in 1 oil for lube.

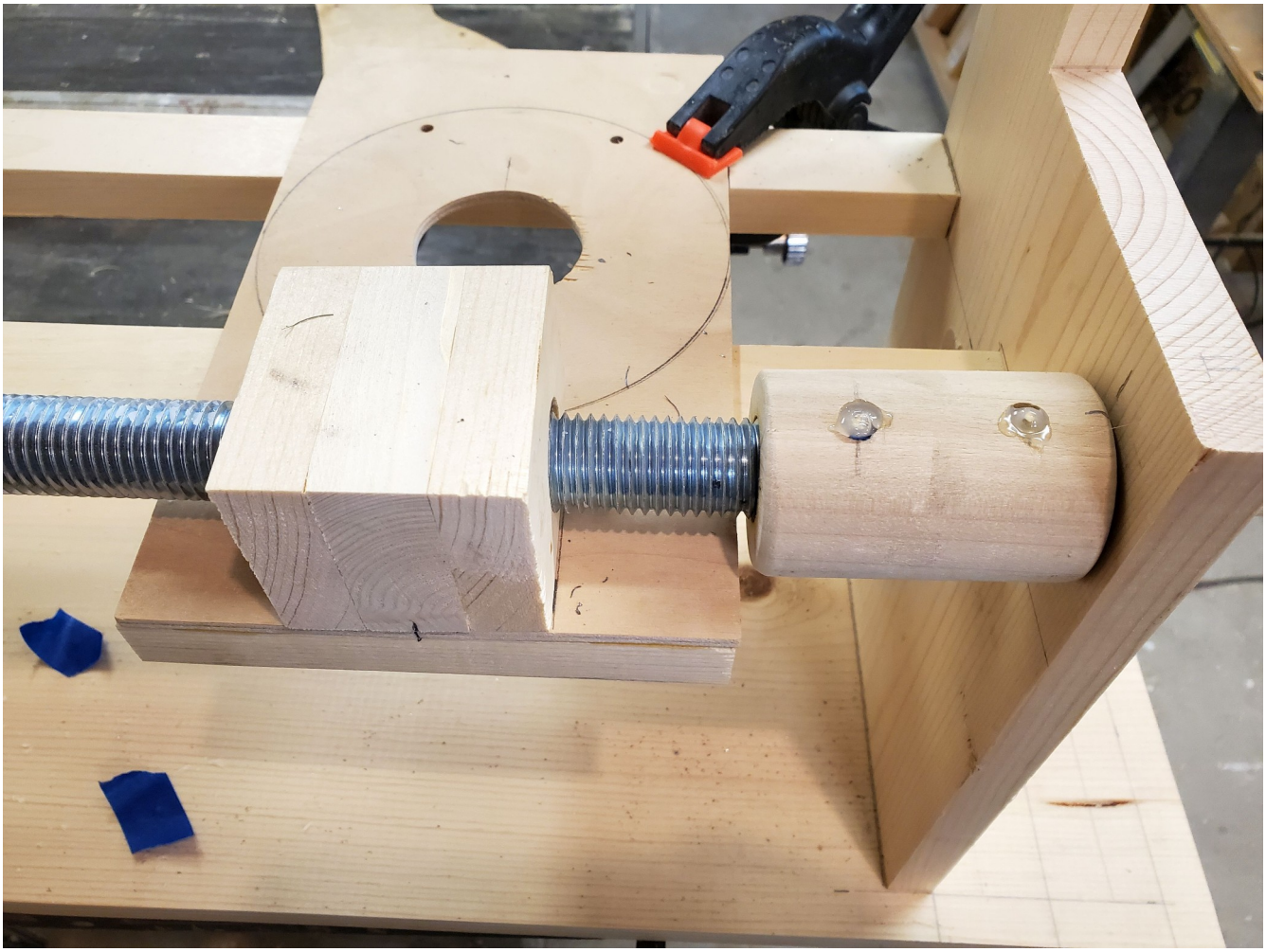
Hack-sawed head off the 4.5 long ¼ diameter bolt, ground burr on grinder to make it safe.

End of Day December 2, 2025



December 3, 2025

Ended up using 1/8” diameter brass pin on ¾” wood dowel part of coupling, and 3/16” brass pin on the 1” steel threaded rod portion of the wood coupling. Used hot melt glue, which is easily removable to secure the brass pins in place.



Whole Assembly

Determining proper gear center distance

I usually take a scrap piece of pine, drill 2 holes of ¾” inch to hold short dowels, then test how well the gears run.

Theoretical distance between 3” and 10” gears is 1.5 + 5 = 6.5”

Did 2 tests, added 1/16” to 6.5” distance, and then 1/8” to 6.5” distance. Based upon my past experience building big gears, probably need the 1/8” distance.

I rotated the gears by hand on the test fixture, and 1/8” distance worked the best. Too tight at 1/16”. This clearance distance is needed because you can not cut the gears perfectly, and also have 0 run-out from the gear hole center and the pitch diameter of the teeth.

Next

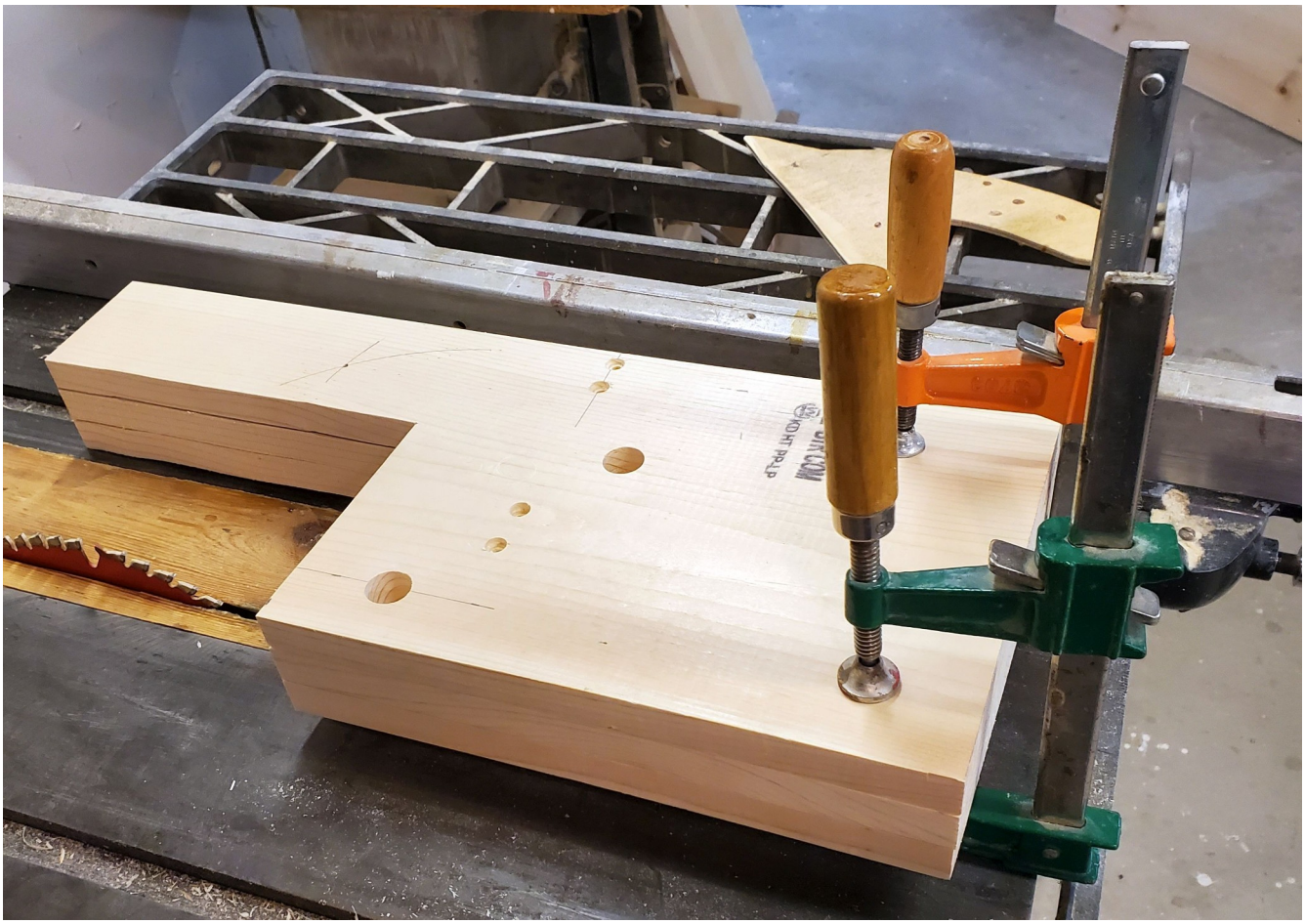
On the LH vertical board of the 3 boards on the RH side of the fixture, which is made, I have drilled 2 of the 3 shaft holes needed already (hole for 1” threaded rod, and hole for 2” dowel being machined). My plan is to swing an arc with a compass from these shaft centerlines using a radius of 6.5” plus 1/8”. Where they intersect is where I drill the 3rd shaft hole for the gears between these 2 shafts.

How to mark center of 2 axle holes already drilled?

I have a little fixture where you put in a dowel into a drilled hole, then a screw marks the center. I did this on 2 pieces of ¾” dowel, then cut them to ¾” long, and then dropped them into the holes already drilled. This let me put a compass in the dowel plug centers and draw the 2 arcs at 6.5 + 1/8” to mark the location of the top axle hole. Worked nicely!

Clamping up 3 vertical pieces on RH side, then drill the axle holes all at the same time

This maximizes the chance the axle holes are properly aligned to each other in all 3 vertical pieces.



AMT
MADE IN TAIWAN

Luan Plywood washers

I have learned on past gear projects, one needs to use washers to prevent large gears from wobbling and then rubbing against their supports. I made 6 wood washers from 3/16” thick Luan plywood with 1.5” OD and ¾” ID. I will apply paste wax to these also.

Houston……..we have a Minor Problem

Once I got the whole assembly rough assembled, I tried turning all the gears from the big 10” gear, that I was planning on installing the hand crank. This big gear is coupled to the 2” diameter dowel to be machined.

Boy, it took a lot of torque to turn this big gear, more torque than I can generate on my normal hand crank with about a 5” throw !!!!!!!!!!! Cranking in this direction, I am trying to speed up the router carriage by a ratio of 11 to 1 roughly.

I went to the LH end of the 1” threaded rod, and it is relatively easy to turn by hand and takes much lower torque than trying to turn the big gear on the RH side. Turning the threaded rod, means I am essentially trying to slow down the piece being machine by a 11:1 ratio.

I don’t remember the gear train torque formulas, but I’m guessing slowing it down takes less torque than trying to speed up the gear train??

Perplexity confirmed that trying to speed up the gear train takes about 11 times more torque than trying to slow it down. I will switch the hand crank to the LH side on the big threaded rod.

Next Problem

I tried my best using a rod marking tool for the center of each end of the 2” dowel to be machined. I then lined up the ¾” Forstner bit in the tail-stock of my old lathe to center on my awl punch mark.

But when I went to install the 18 long piece of 2” dowel to be machined, along with the pieces of ¾ dowel on both ends, I had way too much run-out. On one end I have a TIR (total indicator reading) of ¼” and the other end is ½”

This is too much variation for the marble groove I want to cut with the router??

1. saw dowels off each end on miter saw
2. cut 1” long piece from my inventory of 2” dowels.
3. Chucked in lathe, used 90 degree carbide insert to turn in little dimple where center is
4. Put ¾” bit in tailstock, slid up tailstock making sure point of Forstner bit went into the center mark
5. Drilled about ½” deep, can not drill through with chuck I am using
6. held with big pliers on drill press to keep from spinning, drilled rest of way through
7. glued onto end of 18” dowel to be machined
8. repeated for other end

First crude check on groove in table saw, rotating it, looks like a lot less run-out, can’t measure until I glue in the ¾ dowel pieces on each end.

Morning of December 4, 2025

¾” dowels that you buy are different OD sizes. On one of them, it must be a little smaller because I have some slop when I insert into the 1” long stubs on the ends of the 18” long piece being machined.

I am going to put the 18” long piece of 2” stock in the vise vertically, put the glue in the hole, insert the ¾” dowel, then use my small machinist square to try to get it perpendicular to the face, or parallel to the 2” dowel.

I did this and kept checking with the square until the glue seemed to be set. Put in groove in table saw table and rotated, visually the run-out looks pretty good.

Then put it in the oven at 120F to finish drying before I do the other end.

New Crank Handle on LH side attached to 1”x8 TPI threaded rod

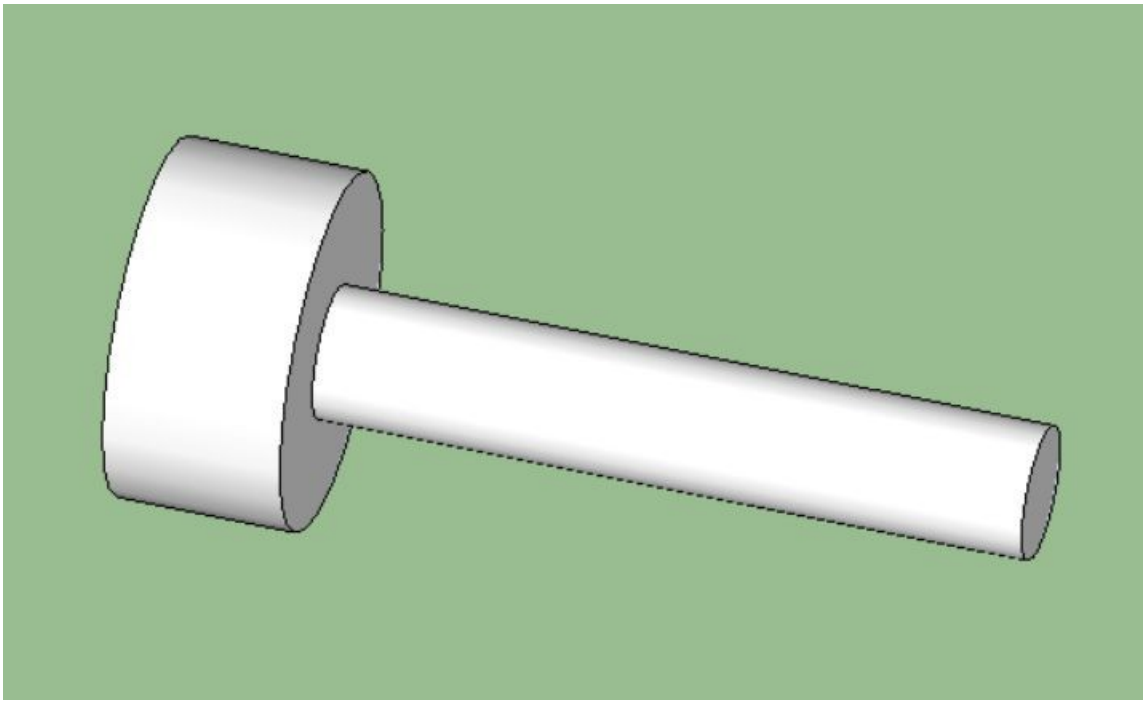
Both, this really works smoothly and takes almost no effort in terms of torque to crank it!!

Better way to reduce run-out of the 2” dowel to be machined

McMaster-Carr carries a lot of hardware. I asked Perplexity and it suggested a few options, but none of them very great.

It might just be easier to put a piece of 2" dowel into the lathe, leave 1 end at 2" and maybe 1" long, then turn other end down to 3/4" and the length I need for my Archimedes screw fixture, then glue that piece onto the end of the 18" long piece of dowel I want to machine, then after screw shape is done, just cut off the end and I can reuse it on another part to be machined?

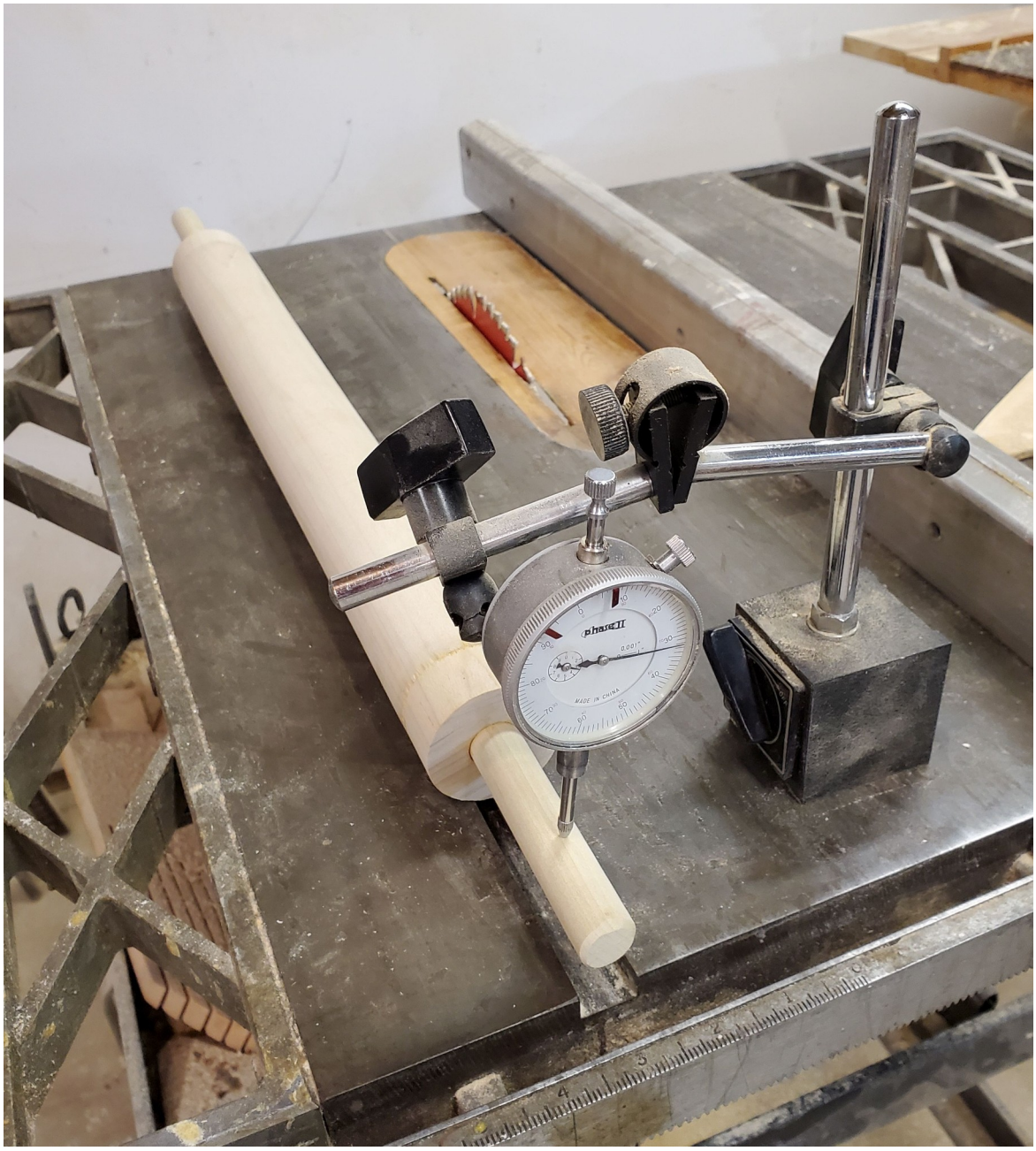
I need 4 to 5 inches to stick out on each end, which should be doable on my old 1939 Montgomery wards lathe.



Not going to do this at this time, maybe in the future.

TIR after Using 2 stubs glued on each end

.090” on 1 end and .050” on the other end. Quite an improvement from ¼” to ½” TIR on the first attempt gluing in short lengths of ¾” dowel into holes drilled in the ends of the piece to be machined !!!!!!!!



Mechanical Stops on the Carriage

I added a wood block at the RH side and a screw at the LH side to act as stop when the carriage has completed its stroke.

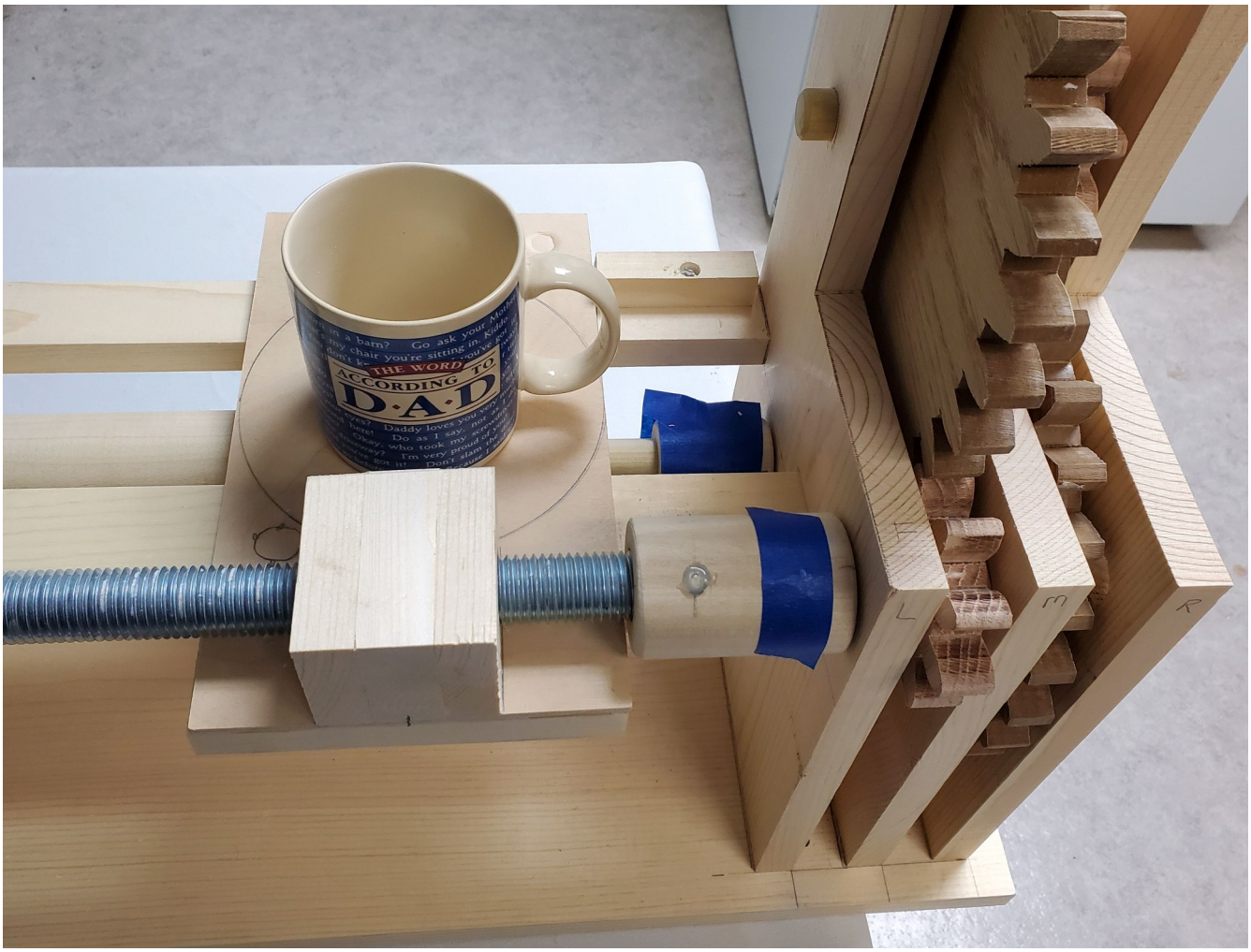
Variable speed drill works for quicker return of the Carriage

I hooked it up and it worked great to return the router from the LH side to the RH home position. This will speed up things.

Fixture Complete – Waiting on Router Bit to arrive in the Mail

Photos below show the condition of the fixture.

D·A·D


THE WORD
ACCORDING TO
D·A·D
L
M
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Took 12 days to get the Router Bit

Ordered Nov 28, and did not receive it until DEC 8th. Don't know why it took so long……..Lee Valley took over MLCS router bits and maybe there is a screw up there!!

Installing router bit

removed 2 screws holding square nut wood fixture to the sliding plate. Installed router bit, then router onto the sliding plate. Slipped plate in between 1 sliding rail and the 1" threaded rod, installed 2 wood screws into the sliding plate. Worked OK

Raised router bit so not hitting the piece to be machined, as I cranked sliding carriage into the right position.

Hot Melt Glued in the Brass Pins

they were held on with blue masking tape, but tape falling off after a week waiting for the router bit, so time to hot melt glue them in.

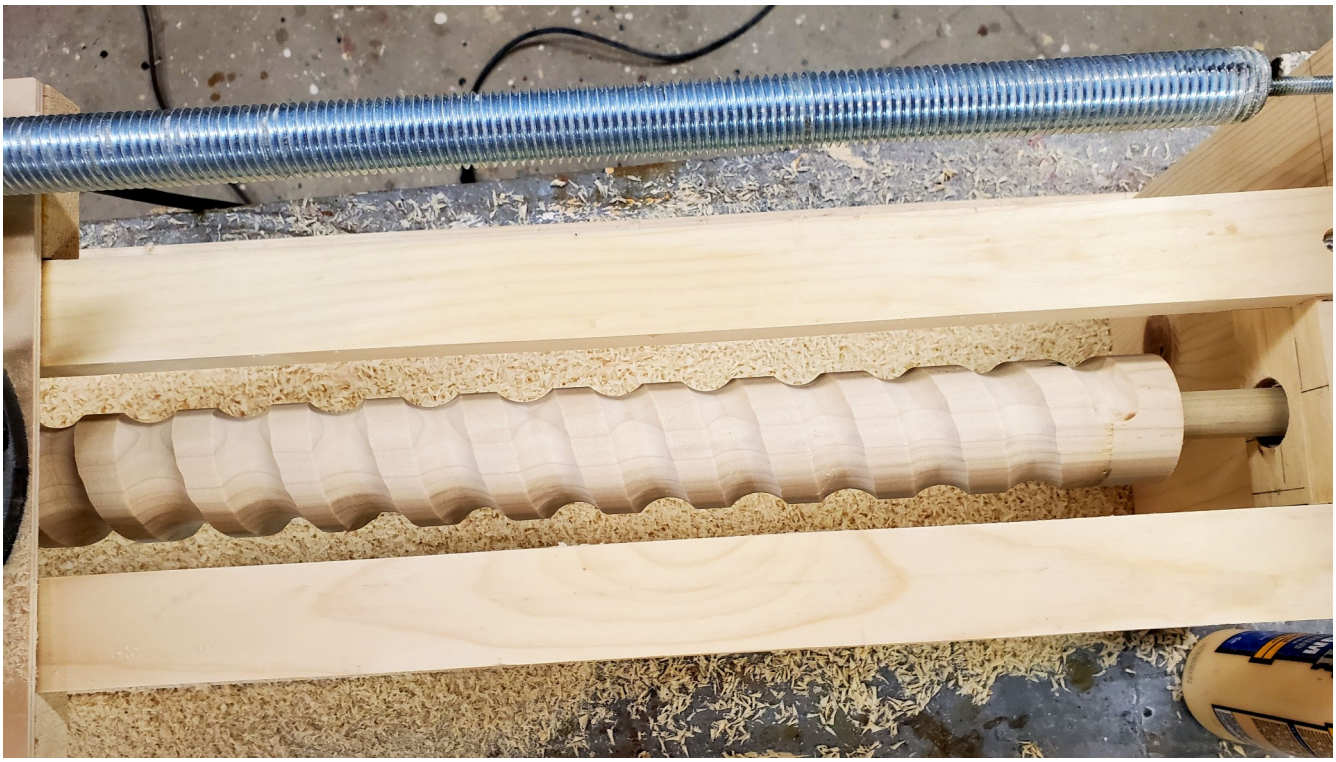
Starting up the Machine

Lowered bit ¼” deep by using the counter on the depth changing screw on the router.

Held down router with my hand, not sure I have to or not.

Started up and ran OK. Made video, but need to add lighting and change the angle.

1st Pass Gave Beautiful Results!!

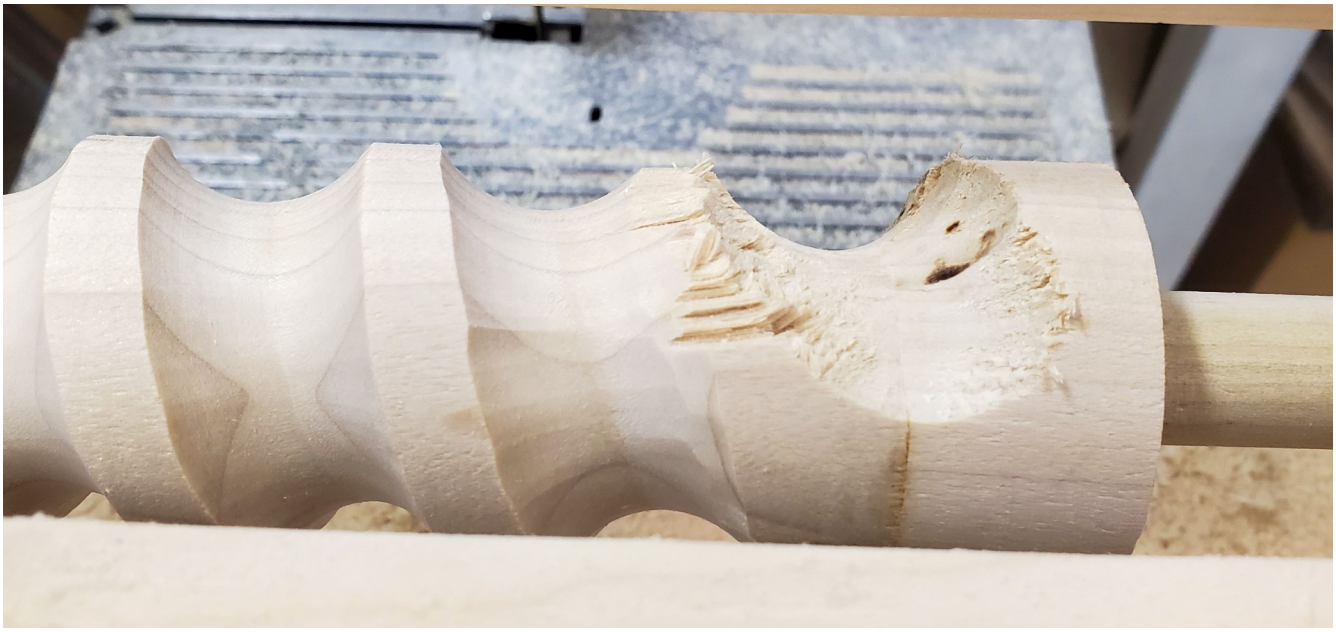


Ran smoothly the whole distance, no catching or nothing.

I thought “Boy this is going to be easy to do the other passes”!!!

Houston We Have a Problem

On 2nd pass with router, knocked out a chunk??



I noticed I have quite a bit of slop or backlash in the square nut fixture, the nut could move about 1/8”. So cut 2 sheet metal washers, and tightened it up pretty good.

Put fixture up on my bandsaw table, which is high enough I can see what is going on below on the router.

Made a 3rd pass OK……...but 4th pass started taking chunks out again……...DARN

I am returning the router carriage to home position using and electric drill with the router off……...then lower router an 1/8” and start hand-cranking so carriage moves left.

Seems like edge of bit catches on side wall of 2” dowel and “kicks” it. I don’t know why, but I have a lot of slop, maybe 10 or 15” degrees in the coupling between the gear and the piece being machined??

I think this slop is allowing the piece being machine to rotate when it kicks? Need to reduce this play in this coupling somehow?

Actually, there is not much backlash in the set of 4 spur gears. All of the slop seems to be in this coupling.

I have made a lot of wood sleeve type couplings before, but they have not experienced the level of torque from a router bit kick.

How do I take out the slop in the coupling?

Split wood coupling with 2 hose clamps

I slit the 1.5” OD wood coupling by sawing a slot using the bandsaw, and bought 2 hose clamps from ACE for 1.5” size. You have to make sure shafts are timed up when you replaced this coupling if you have made at least 1 router already on the piece being worked.

I also kept pressure down on the router top using my right hand while cranking with my left. I think this keeps router from jumping up and causing the bit to catch.

I made several more passes, and no chunks taken out……..hooray !!!!!!!!!

How Deep to route the grooves for the marbles ???

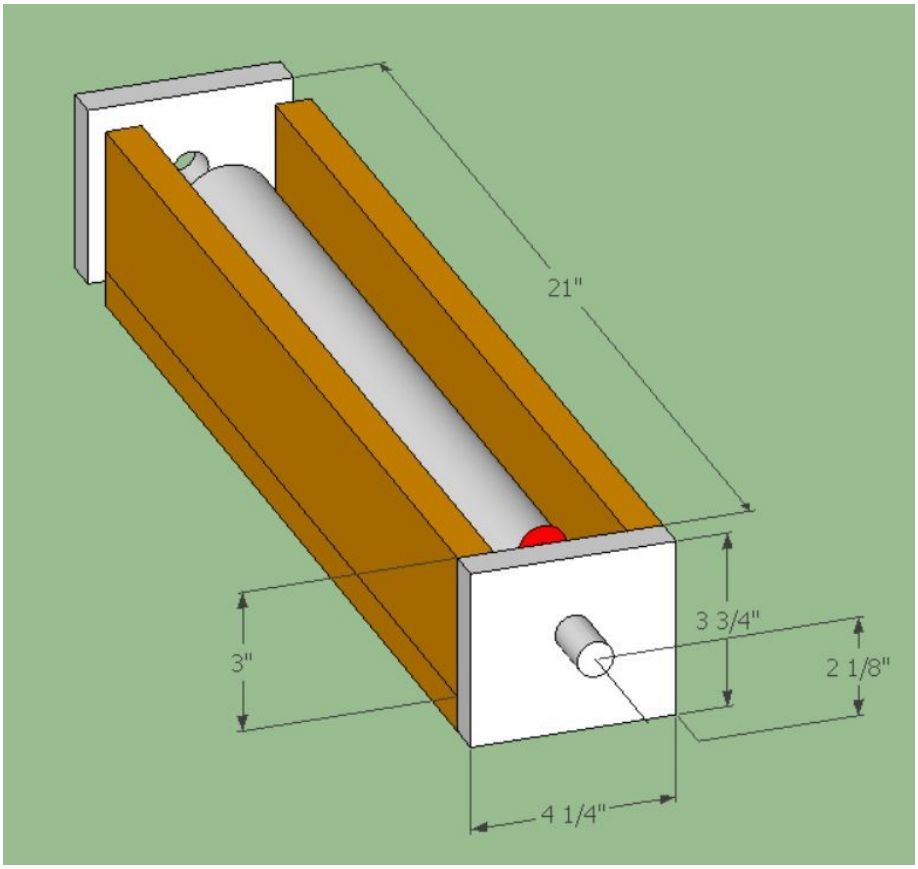
Since they are 1” diameter marbles, I am thinking you probably want half of the marble into the screw, or ½” deep.

Need to verify this works if Archimedes screw is at 75 degree angle to horizontal and it raises marbles OK.

Can I repair missing chunks?

Might have to go back to Ace and get some wood filler or putty. Trying some Plastic Wood.

Archimedes Screw works with test fixture at steep angle



I tipped it up pretty steep, maybe 70 degrees and it worked fine.

Thoughts at this Stage of Project

Boy, I was so happy when I made the 1st pass with the router, and everything worked great, with no chip-out of the threads or anything else.

I got pretty discouraged when I started doing subsequent router passes, the router caught, and I chipped out some areas.

I think this might have been because I was not applying downward pressure with my right hand while the router was running?

The last few passes went perfectly, with no more chipping.

I will likely make Serial #2 soon.

I want to see if I can save the 1st piece or not.

Ideas

1. Could I use a smaller diameter core bit first, like ¾" diameter to remove some of the material?? Then follow up with the big 1-1/8" bit?

Thoughts

If I have the 18" long Archimedes screw at a 75 degree angle to the horizontal to take 1" marbles up a ramp, How do I hand turn the screw?

> I could just put a handle on the top of the screw and crank it, but kids might have a hard time cranking it because they can not reach it.

Do I need to slow down the hand crank speed?

Will a grist mill peg gear set work at an angle not at 90 degrees to each other? I could slow down the speed by 2:1 ratio if I can get a peg gear set to work at 75 degrees versus 90 degrees.

Do I use 2 of the Archimedes screws in 1 marble game, one raises the marbles, 2nd one transport them horizontally across the game, then start dropping down using usual track and bowls? With 1 input crank, have to figure out how to tie gear train together?

DAP Plastic Wood – little metal can

Put on 1st coat, put in oven at 120F to dry quicker.

Sanding with 1" drum sander 220 grit on the drill press…….it actually worked pretty good.

Put on 2nd coat to build up worst spot where biggest chunk was thrown out.

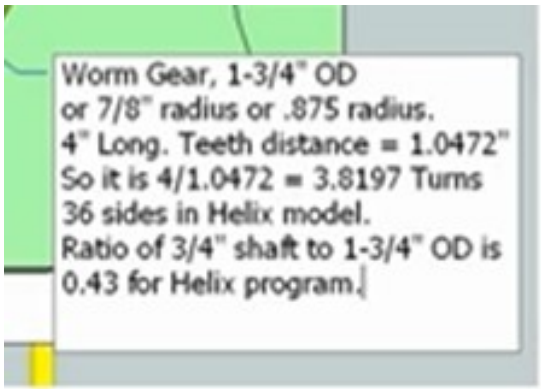
1st Archimedes screw after Plastic Wood and Sanding

Hose instead of wood coupling from gear set to piece being machined

I am concerned that on future pieces I am making, this split wood coupling might slip, which could ruin the piece being machined on subsequent passes. So I got a piece of clear plastic hose with a ¾” ID from ACE this AM.

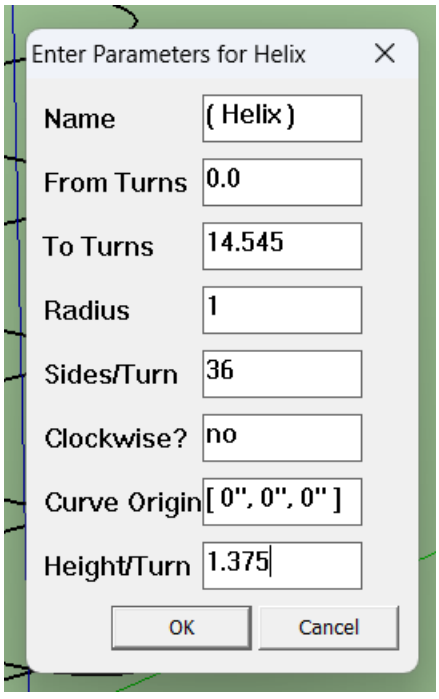
How to Draw the Archimedes screw in Sketchup

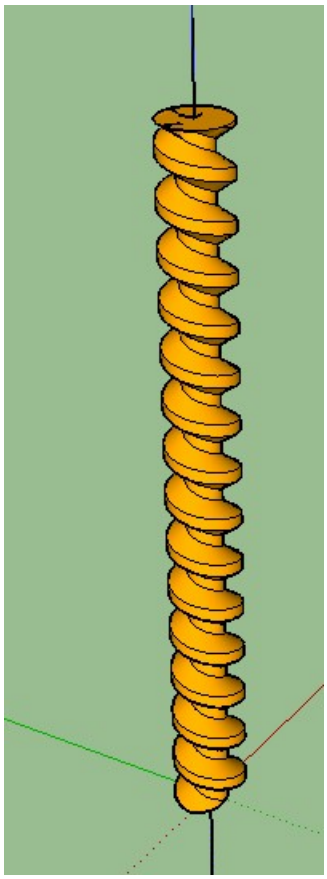
going back to my YouTube video about how to draw a worm gear……..


Worm Gear, 1-3/4" OD
or 7/8" radius or .875 radius.
4" Long. Teeth distance = 1.0472"
So it is 4/1.0472 = 3.8197 Turns
36 sides in Helix model.
Ratio of 3/4" shaft to 1-3/4" OD is
0.43 for Helix program.

Archimedes Screw Case:

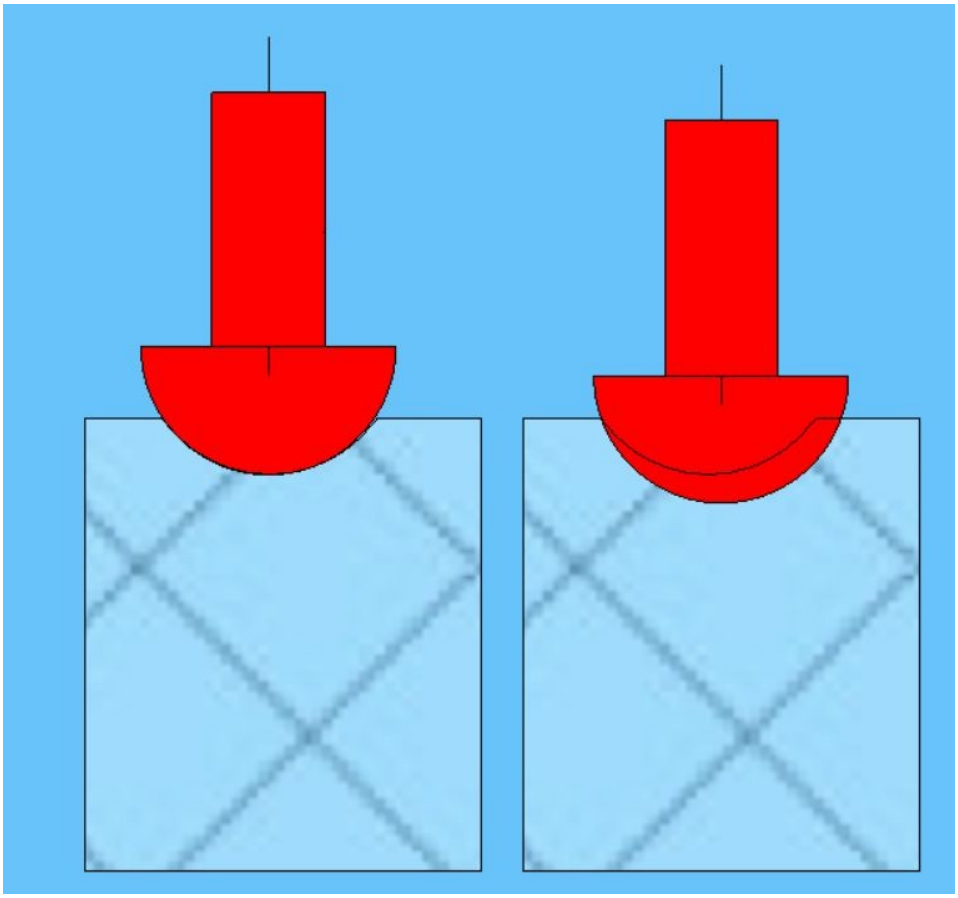
Gear, 2” OD
20” long
teeth distance is 1.375”
so 20/1.375 = 14.545 Turns
36 sides in Helix model
Ratio of ¾” shaft to 2” OD is .375 for Helix program. No, make groove ½” deep, so 2 – 2 times ½ = 1 diam left, so ratio is ½ = .50





Looks Good!! Can use this to design the marble lifting model with the Archimedes screw!!

Why might the router bit be catching on multiple passes?



In image above, I made the center of the router bit be off by 1/16” due to backlash or slop in the drive-train. This results in more material must be removed from 1 side versus the other, which might cause the router bit to catch or kick??

Don’t know how to prevent this, since there will always be some slop in the drive-train, router carriage, etc.

Making SN #2 Archimedes Screw

1. Saw 2” dowel to 18” length
2. Saw 2 pieces from 2” dowel each 1” long
3. chuck 1” long piece lathe, mark center with carbide tool. Adjust tailstock with ¾” Forstner bit so bit center is in center mark of dowel and tighten tailstock, drill to maybe ½” deep (can’t go full depth of 1” or bit would hit small steel 3-jaw chuck)
4. Finish drilling through on drill press, both pieces
5. Using ¾” wide groove in table saw top, glue and clamp 1” long pieces on each of 18” long dowel
6. Quick dry in oven at 120F
7. Saw ¾” dowels for each end, measuring length from SN #1

8. Glue and make square to face of dowel using machinist square, dry.

Basically the same process I ended up for making blank for SN #1.

Blank #2 Ready to go into the Archimedes screw making machine

How did SN #2 go in the machine?

Made sure bit was just contacting the 2” dowel blank.

Marked that CCW on the router screw lowers the bit, got confused when I was making SN 1, this helps a lot !!

Lowered bit 2 rev’s on counter which is 1/8” depth.

Cranked and pass #1 went fine.

Returned to home position using electric drill.

Using router counter, lowered bit 1 rev, which is supposed to be 1/16”.

Passes #2, 3, and 3 went fine…….no chipping at all.

Maybe the secret is to decrease from 1/8 router depth increments down to just 1/16 per pass? If bit is a little off from center position, then 1/16” cut is not going to impact it too much, or cause it to kick.

I want roughly ½” deep, which is 8 passes at 1/16” per pass. Takes a while, but that is OK if no chipping !!!!!!!!

Stopped at 7/16” depth or so

Everything went fine, I did not count, probably did 12 or so passes at 1/16” cut per pass on the router bit. Then, I had a chip-out just after I started a pass. On the RH side of the blank……..

I suspect the failure was caused because the router hit a “hard” spot, and the wood was weak since it was glued to the end cap. That then might have caused the chip on the left of this spot.

I measured the depth as best as I could, it was about 7/16”, so to avoid any more chipping, I called it quits on this SN 2 piece.

Except for this one chip spot, it is gorgeous !!!!!!!!!!

I am out of 2” dowel stock, so I can’t make any more right now, I will have to get some more 2” dowel stock from Menards on the next trip to Bloomington.

Secrets to Success Learned so Far

1. Make a good blank with minimal run-out from the ¾” dowel on the ends to the main 2” dowel. This can be accomplished by drilling a 1” long piece of 2” dowel in the lathe and drill press, gluing it onto the ends, then glue in the 2 dowels, ¾” diameter, on each end, assuring squareness using a machinists square.

2. Use a higher quality coupling, like a piece of ¾” ID hose to connect the gear train to the piece being machined, with hose clamps.

3. Take out as much backlash as possible in the wood assembly holding the 1” square nut by using sheet metal shims.

4. Only cut or route in 1 direction to avoid backlash issues. Crank router carriage so it travels right to left. Stop, Use electric drill to turn the crank and move the carriage right back to near its home position. Hand crank the last ½” of carriage travel until you hit the stop.

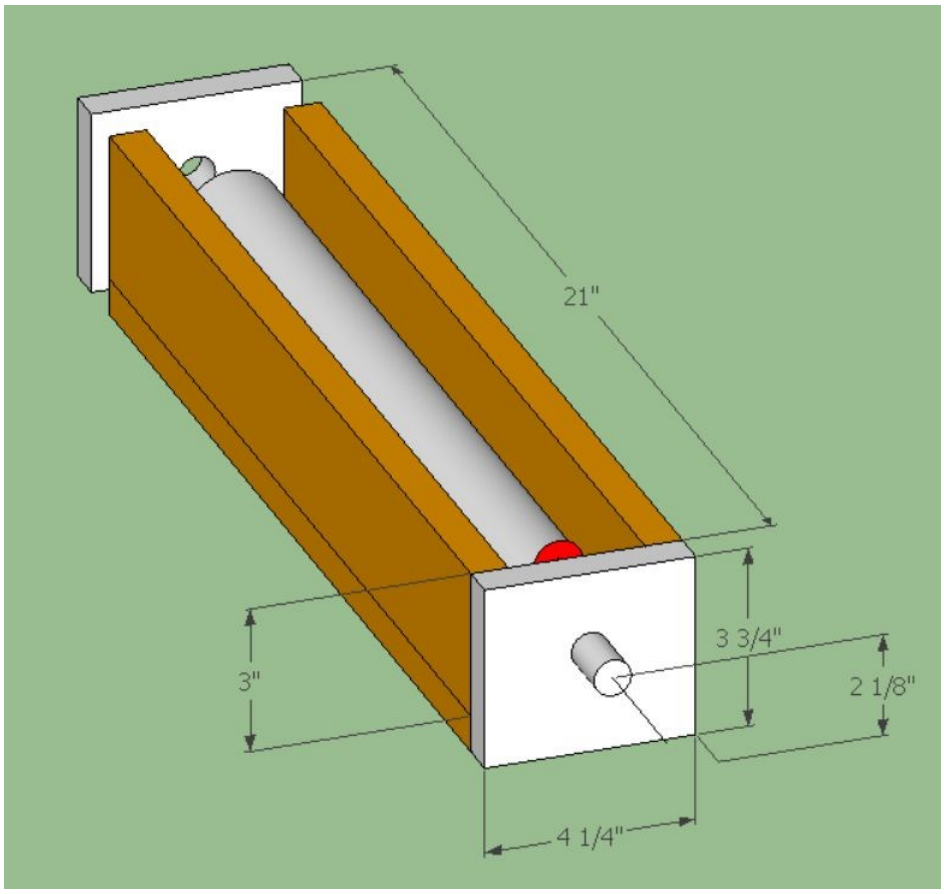
5. Take lighter passes. 1st pass can be 1/16 to 1/8, but all subsequent passes should be 1/16” to minimize chipping.

After 2 units, I think I can make more units with minimal chip-out.

I am very happy with the performance of my Archimedes screw making machine :)

What angle will it run at?

I made a crude box fixture to use for this angle test.



Test Results:

with box at a 57 degree angle to the horizontal, the marble fell out when it hit the bad tooth which is not fully repaired.

At 52 angle it ran fine, even with the bad tooth.

Angle to vertical would be 90 – 52 = 38 degrees. I was thinking it might run at 15 degrees to vertical, or 75 degrees to horizontal, based upon my tests, this won't work.

How can I make it steeper to better fit in my wood model.

A plexiglass cover might keep it from falling out? Actually I will use clear acrylic from ACE. Might need to test this?

December 11, 2025

YouTube video

I made a youtube video for this project.

https://youtu.be/RhMSDVO4U8s

So this concludes this project, unless I make some updates at a later date.

It was Fun!

Dale C. Maley
December 11, 2025
Fairbury, Illinois